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IS 7072 (1973): Glossary of terms relating to emission spectroscopy [MTD 4: Wrought Steel Products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
GLOSSARY OF TERMS
RELATING TO EMISSION SPECTROSCOPY

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GLOSSARY OF TERMS

RELATING TO EMISSION SPECTROSCOPY

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(Continued on page 2)

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(Continued from page 1)

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Indian Standard

GLOSSARY OF TERMS

RELATING TO EMISSION SPECTROSCOPY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 November 1973, after the draft finalized by the Methods of Chemical Analysis Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard has been prepared to assist the manufacturers and the consumers in the correct interpretation of common terms used in emission spectroscopy. It is hoped that this glossary of terms will help in establishing a general recognized usage and eliminate confusion which may sometimes arise out of individual interpretation of these terms.

1. SCOPE

1.1 This standard defines commonly used terms in the emission spectrochemical analysis of minerals and metals.

2. DEFINITIONS

2.1 Absorption — A decrease in radiant energy when passing through matter, resulting in a corresponding increase in the energy of the absorbing system.

2.2 Accuracy — The quantitative expression for the deviation of spectrochemical determination for an accepted reference level.

2.3 Analysis — The ascertainment of the identity or the concentration, or both of the constituents or components of a sample.

2.4 Analytical Curve — The graphical representation of the relation between the intensities of a line, or a band and the concentration of the substance producing it.

2.5 Analytical Gap — The distance between the two electrodes used in spectrochemical analysis; also called the electrode gap.

2.6 Analytical Line — The particular spectral line used in the identification and/or determination of the concentration of an element.

2.7 Angstrom (Å) — A unit of length, equal to 1×10^{-10} m.

2.8 Anode — The electrode to which the positive terminal of a dc source is connected.

2.9 Arc Line — A spectral line produced by radiation from neutral atoms, due to the transition of the outer electrons.

2.10 Arc Spectrum — A series of spectral lines emitted by neutral atoms by the transition of the outer electrons.

2.11 Axis, Optical — The line joining the centres of curvatures of the surfaces of a lens or mirror system.

2.12 Background — Background caused by the continuous radiation which is often superimposed on the discrete wave lengths.

2.13 Buffer, Spectrochemical — A substance which is a part of a sample or is added to it, and which minimizes the dependence of the radiation upon the sample composition other than the concentrations of the elements being determined.

2.14 Carrier, Spectrochemical — A material added to a sample to facilitate vaporization into analytical gap. The carrier may serve to sweep the entire sample rapidly into the arc or it may be limited in its action to assisting in the fractional distillation of the sample.

2.15 Cathode — The electrode to which negative terminal of a dc source is connected.

2.16 Characteristic Curve, Emulsion — See 2.29.

2.17 Collimator — A lens or mirror system used to obtain a parallel beam of light.

2.18 Concentration (C) — The quantity of a constituent contained in a unit quantity of sample.

2.19 Concentration Index — The concentration of an element at which the intensities of the analytical and internal standard lines are equal.

2.20 Contrast Factor — The slope of the linear part of emulsion calibration curve (log-log scales).

2.21 Detection Limit — A stated limiting value that designates the lowest concentration or mass that can be estimated or determined with confidence and that is specific to the analytical procedure used.

2.22 Dispersion, Linear — The derivative $\frac{dx}{d\lambda}$ where x is the distance along the spectrum and λ is the wave length. Linear dispersion is usually expressed as millimetres per angstrom.

2.23 Dispersion, Reciprocal Linear — The derivative $\frac{d\lambda}{dx}$ where λ is the wave length and x the distance along the spectrum. The reciprocal linear dispersion is usually expressed in angstroms per millimetre.

2.24 Electrode — Either of the two terminals between which an electric discharge occurs.

2.25 Electrode, Counter — The electrode which does not contain the sample to be analyzed and is used opposite to the self-electrode or supporting electrode.

2.26 Electrode, Preformed — An electrode produced commercially, and available in different shapes and sizes, ready for use in spectrochemical analysis.

2.27 Electrode, Self — An electrode composed of the material being analyzed.

2.28 Electrode, Supporting — An electrode, other than a self-electrode, on which or in which the sample is supported.

2.29 Emulsion Calibration Curve — The plot of a function of the relative transmittance of the emulsion versus a function of the exposure.

2.30 Excitation Index — The ratio of the intensities of two selected spectral lines of an element having widely different excitation energies. This ratio serves to indicate the level of the excitation conditions in the source.

2.31 Excitation Potential — The amount of energy that is required to be supplied to an atom in order to raise its energy level. It is usually expressed in electron volts.

2.32 Exposure — The irradiance of a receiver (photographic emulsion, photomultiplier tube, etc) integrated over the exposure time.

2.33 Exposure Time — The time during which the receiver is irradiated.

2.34 External Standard — A standard sample used for direct comparison with the unknown sample.

2.35 Fog — Extra spectral blackening of a photographic emulsion.

2.36 Frequency (ν) — Number of cycles per unit time. ν is given by $\frac{c}{\lambda}$ where λ is the wave length and c is the velocity of light.

2.37 Gamma (γ) — The slope of the straight line portion of the H and D curve (*see also* 2.43).

2.38 Grating, Concave — A reflection grating whose surface is concave.

2.39 Grating, Diffraction — A series of a large number of narrow, close, equally spaced diffracting slits or grooves capable of dispersing light into a spectrum.

2.40 Grating, Plane — A transmission or reflection grating whose surface is flat.

2.41 Grating, Reflection — A diffraction grating from which the incident light is reflected to form the spectrum.

2.42 Grating, Transmission — A diffraction grating through which light is transmitted to form the spectrum.

2.43 H and D Curve — The emulsion calibration curve in which the optical density is plotted as a function of the logarithm of the exposure (named after Hurter and Driffield).

2.44 Homologous Pair — An analytical line and internal standard line so chosen that the ratio of their intensities (radiant powers) has very little change with variations in the excitation conditions.

2.45 Inertia (of Photographic Emulsion) — The distance measured between the intercept of the straight line portion of the H and D curve with the line of zero optical density and the optical density axis.

2.46 Intensity, Radiant — The radiant power emitted per unit solid angle in a given direction.

2.47 Intermittency Effect — The departure from the reciprocity law when the exposure of a photographic emulsion is made in a series of discrete instalments rather than in a continuous exposure of the same total energy.

2.48 Internal Standard — A material present in or added to samples in known amount to serve as an intensity reference for spectral measurement.

2.49 Ionization Potential — The energy (expressed in electron volts) required to remove a given electron from its atomic orbit and place it at rest at infinite distance.

2.50 Latitude of a Photographic Emulsion — The ratio of the exposure limits between which the H and D curve is essentially linear.

2.51 Line Pair — An analytical line and the internal standard line with which it is compared.

2.52 Microphotometer — The instrument used for directly measuring the transmittance, optical density or Seidel function of a photographic image.

2.53 Neutral Filter — A filter which possesses constant transmittance at all wave lengths within a specified range.

2.54 Optical Density (D) — The logarithm to base 10 of the reciprocal of the relative transmittance of a photographic emulsion. $D = \log \frac{1}{T}$ where T is the relative transmittance.

2.55 Precision — The quantitative expression for the agreement among repetitive spectrochemical determinations.

2.56 Pre-arcng Time — The initial arcing period during which no exposure is given.

2.57 Prefogging — Intentional uniform fogging photographic emulsion before exposure.

2.58 Presparking Time — The initial sparking period during which no exposure is given.

2.59 Reciprocity Law — The statement that in a photochemical reaction, a constant effect is produced if the product of time and intensity is a constant.

2.60 Reproducibility — A measure of deviation of test results from their mean value, the determinations being carried out by different operators using apparatus generally understood to be located in different laboratories.

2.61 Seidel Function (Δ) — A function used in the emulsion calibration for obtaining a straight line characteristic curve. It is given by the relation

$\Delta = \log \left(\frac{1}{T} - 1 \right)$ where T is the relative transmittance.

2.62 Self Absorption — The reduction in intensity at the centre of emission lines, caused by the selective absorption by the cooler outer vapour of the source envelope of radiation emitted by the hot central core.

2.63 Sensitivity, Concentration — The ratio of charge of either the intensity of a line or the intensity of a line pair to concentration.

2.64 Spark Line — A spectral line produced by radiation from ions.

2.65 Spectroscope — An instrument which disperses radiation into a spectrum for visual observation.

2.66 Spectrograph — An instrument which disperses radiation and gives a record of the spectrum on a photographic emulsion.

2.67 Spectrometer, Direct Reading — An instrument which disperses radiation and measures the intensity of the individual dispersed lines.

2.68 Spectrochemical (Spectrographic, Spectrometric and Spectroscopic) Analysis — Elemental analysis involving discrete spectra.

2.69 Spectrum — A series of images of the slit of a dispersing instrument caused by the dispersion of radiation passing through it, the position of the images depending on the element present in the radiating source.

2.70 Standard Sample — A material of known composition which is used for calibration and which closely resembles in chemical and physical nature the materials with which the analyst expects to deal.

2.71 Standard Sample, Primary — A standard sample whose composition is certified by a recognized agency or group as the weighted result of the work of two or more independent laboratories, and whose reliability and limitations for the intended analytical procedure have been established.

2.72 Stray Radiation — All undispersed radiation which reaches the detector at wave lengths which correspond to dispersed radiation.

2.73 Transmittance (T) — The ratio of the transmitted intensity to the intensity of radiation incident on the material, both being measured under same conditions. The beam is understood to be parallel and incident at right angles to plane parallel surfaces of the sample.

2.74 Transmittance, Relative (of a Spectrum Line Image) — The ratio of the transmittance of the photographic image of a spectrum line to the transmittance of an adjacent clear (unexposed but developed) portion of the photographic emulsion.

INDIAN STANDARDS

ON

METHODS OF CHEMICAL AND SPECTROGRAPHIC ANALYSIS

Aluminium

IS:

504-1963 Aluminium and its alloys (*revised*)

Copper and Copper Alloys

IS:

440-1964 Copper (*revised*)

3186-1965 Cadmium copper

3187-1965 Copper-nickel-zinc alloys

3685-1966 Brasses

3883-1966 Copper-tellurium alloys

4027-1967 Bronzes

6517 (Part I)-1972 Copper master alloys: Part I Copper-nickel alloy

Iron and Steel

IS:

228-1959 Pig iron, cast iron and plain carbon and low alloy steels (*revised*)

228 (Part I)-1972 Steels: Part I Carbon by volumetric method (for carbon 0.1 percent)
(*second revision*)

228 (Part II)-1972 Steels: Part II Manganese in plain carbon and low alloy steels (arsenitic method) (*second revision*)

228 (Part III)-1972 Steels: Part III Phosphorus (Alkalimetric method) (*second revision*)

1546-1960 Arsenic in iron and steel

6226 (Part I)-1971 Apparatus for chemical analysis of metals: Part I Determination of carbon by direct combustion

Spectrographic Analysis

IS:

2271-1967 Platinum

2599-1963 High purity zinc and zinc base alloys for die casting

6010-1971 Recommended practice for photographic processing in spectrochemical analysis

Nickel

IS:

1952-1963 Nickel anodes

2390-1967 Foundry nickel

2766 (Part I)-1968 Primary nickel, Part I

Refractories

IS:

1335-1959 Alumina in refractory materials (*tentative*)

1527-1972 High silica refractory materials (*second revision*)

General

IS:

1338-1958 Certified samples for metallurgical analysis